Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	DOCKET FILE COPY ORIGINAL
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Amendment of the Commission's Rules to	)	ET Docket No. 96-102
Provide for Unlicensed NII SUPERNet	)	RM-8648
Operations in the 5 GHz Frequency Range	)	RM-8653

REPLY COMMENTS OF

METRICOM, INC.

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SUMMARY

Metricom applauds the Commission for proposing to allocate 350 MHz in the 5 GHz band for unlicensed wireless devices, and believes the Commission has established an important goal -- providing schools, libraries, health care providers, businesses and other users with affordable, advanced telecommunications services including NII access. The comments demonstrate, however, that the technical restrictions contained in the NPRM will permit only limited applications that will require extensive and costly internal wiring. Such applications will not meet the advanced telecommunications needs of our nation's schools and other users.

In contrast, spread spectrum products and services operating under Section 15.247 of the Commission's rules in the 5.8 GHz band and other unlicensed bands are presently providing several of the applications contemplated for the SUPERNet band including low-cost, high-speed, wireless NII access and long-distance links. Unfortunately, it appears clear from the comments that the proposed SUPERNet devices operating in the 5.8 GHz band will not be compatible with spread spectrum devices operating under Section 15.247 of the Commission's rules. If the Commission decides to adopt the proposed rules, Metricom urges it to recognize the extraordinary success of unlicensed products and services in the several Part 15 bands, including 5.8 GHz, and the potential of these devices to provide advanced telecommunications services to schools, hospitals, businesses and other users. Therefore, a paramount concern for the Commission as it formulates final rules

must be the preservation and promotion of spread spectrum operations in the 5.8 GHz band.

The most effective way to avoid interference and ensure compatibility between SUPERNet and spread spectrum Part 15 devices is to require that SUPERNet devices in the 5.8 GHz band to operate in a spread spectrum mode. Metricom urges the Commission to accommodate multimedia uses by amending Section 15.247 to permit wider bandwidth applications than are presently permitted under this rule. Requiring SUPERNet to function in a spread spectrum mode would address many important outstanding issues in this proceeding. It would greatly reduce the risk of interference between SUPERNet and non-SUPERNet Part 15 devices; it would eliminate the threat to present spread spectrum providers that SUPERNet would be elevated in the band; and it would result in efficient use of the SUPERNet band.

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REPLY COMMENTS OF METRICOM, INC.

Metricom, Inc. ("Metricom"), pursuant to the provisions of Section 1.415 of the Commission's rules, by its attorneys, submits these Reply Comments in the above-referenced proceeding.

Metricom is a young, rapidly growing, technologically innovative company based in Silicon Valley and has become a pioneer in the development of state-of-the-art, frequency hopping, spread spectrum packet radio systems. Metricom has invested significant time and resources to develop, manufacture and market sophisticated RF devices which operate on an unlicensed basis pursuant to Part 15 of the Commission's rules. Operating at a gross over-the-air transmission rate of 100 kbps and actual user data rates of up to 28.8 kbps, Metricom's "Ricochet" service is the fastest, most easily deployed, and least expensive wide-area wireless data network available today.

Of particular relevance to this proceeding, Metricom is presently utilizing unlicensed Part 15 wireless technology to provide schools, libraries, businesses and individuals with high-speed wireless access to the NII, school and corporate networks, and on-line services. Metricom has constructed and deployed

unlicensed, wireless data networks on a number of universities and corporate campuses across the U.S. Metricom is also currently providing high-speed, unlicensed data communications to subscribers in the San Francisco Bay and Silicon Valley areas, and will initiate the operation of similar networks in Washington, D.C. and Seattle within the next few months.

I. INTRODUCTION.

As noted in its Comments, Metricom applauds the Commission for proposing to allocate 350 MHz of spectrum in the 5 GHz band for unlicensed wireless devices.[1/] Metricom believes that the Commission's goal of providing schools, libraries, health care providers, businesses and a myriad of other users with affordable, advanced telecommunications services, including cost-effective, high-speed wireless communications and NII access, can only be achieved through the use of unlicensed products and services. It is apparent, however, from both Metricom's internal analysis of the proposed technical restrictions and several comments filed in this proceeding that the proposed NII/SUPERNet ("SUPERNet") devices will permit only one limited application -- short-range, in-room devices that will require extensive internal wiring to reach the end users

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[1/] Comments of Metricom at p. 1.

inside of classrooms, libraries and offices.[2/] Clearly, such devices will not meet the advanced telecommunications needs of America's schools, hospitals, universities, and businesses, and will be cost prohibitive to many such users.

When it adopted the SUPERNet Notice of Proposed Rulemaking ("NPRM"), the Commission apparently believed that the development and deployment of wireless LANs which require costly internal wiring would provide important and needed communications capabilities to schools, hospitals and other users. The comments submitted by a range of consumers and manufacturers of wireless products and services disproved this belief. The Commission must recognize the technological limits of proposed SUPERNet devices. The Commission must also recognize the extraordinary success of unlicensed products and services in the several Part 15 bands, including the 5.8 GHz band, as well as the potential of these devices to offer schools, hospitals, businesses and other users affordable, advanced wireless communications services including NII access.

A paramount concern for the Commission, as it formulates final SUPERNet rules, must be the preservation and promotion of spread spectrum Part 15 uses in the 5.8 GHz band. Spread spectrum devices

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[2/] E.g., Comments of Western Multiplex at p. 5; Comments of the Benton Foundation and Computer Professionals for Social Responsibility at p. 5.; Comments of the Connectivity for Learning Coalition at pp 2-3; Comments of the National School Boards Association, et. al. at pp. 6-7.

in the unlicensed bands, including the 5.8 GHz band, are already providing many of the applications which the Commission desires to achieve for SUPERNet devices; therefore, Part 15 operations at 5.8 GHz must not be impeded.

II. PART 15 PRODUCTS AND SERVICES PROVIDED IN ACCORDANCE WITH SECTION 15.247 OFFER LOW-COST, HIGH-QUALITY NII CONNECTION AND COMMUNITY NETWORKING FOR SCHOOLS AND OTHER USERS.

As a direct result of FCC encouragement over many years, the Part 15 industry has introduced a myriad of low-cost, unlicensed wireless products and services into the marketplace. These products and services include Metricom's "Ricochet" service which is presently providing a number of universities, schools[3/] and other users with high-speed, wide-area, wireless communications including NII access. Also among these products and services are several long-distance, point-to-point, wireless data, voice and video services such as those provided by Cylink and Western Multiplex in the 5.8 GHz band.[4/] These spread spectrum, point-to-

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[3/] Among other schools, Metricom's Ricochet wireless services is presently being used at the Los Gatos High School, Los Gatos, CA, the Malcolm X Elementary School, Washington, D.C., the Valley Christian High School, San Jose, CA, and the Alum Rock Union School District. Ricochet networks are installed at California Polytechnic University, Oregon State University, San Francisco State University, Stanford University, University of Oregon, University of Miami, University of California at Berkeley, and University of California at Santa Cruz. Installation at George Washington University is partially completed.

[4/] Comments of Cylink at pp. 5-6; Comments of Western Multiplex at p. 2.

point, long-distance wireless communications products can potentially link buildings and communities utilizing wireless services such as Ricochet. Together, these types of services offer the schools (and other users) the potential for true long-range community networking.

Present Part 15 services provide true wireless community networking because they provide wireless connectivity to the end user of the system. In their comments, members of the educational community seek wireless "community networks," and, significantly, these comments state that such community networks must include the end user whether that user is in a school, a library or at home.[5/] Part 15 spread spectrum services, such as Ricochet, provide wireless NII access and communications directly to teachers and students in the classroom, parents in their homes, doctors and nurses at a patient's bedside, and persons in their workplaces. Importantly, Ricochet requires no internal wiring.[6/]

This type of network stands in stark contrast to that proposed by other commenters. For example, Apple defines community networking to be a long-distance, line-of-sight, point-to-point,

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[5/] Comments of Connectivity For Learning Coalition at pp. 2-4. Comments of National Association of School Boards, et. al., at p. 5. Joint Comments of Educators at pp. 2-4.

[6/] Several comments from the educational community note that NII access solutions that require extensive internal wiring within schools are prohibitively expensive. Joint Comments of Educators at pp. 2-3. Comments of Connectivity For Learning Coalition at p. 3.

wireless link between two buildings.[7] Under Apple's definition, the wireless portion of the "community network" would not reach any end user. The end user is connected to Apple's community network only by separate and costly inside wire. This type of network will not meet the expressed wireless communications needs of our schools and other users even though it is described as a "community network" by Apple.

III. PROPOSED SUPERNET DEVICES CANNOT COEXIST WITH SPREAD SPECTRUM PART 15 OPERATIONS IN THE 5.8 GHZ BAND.

Metricom strongly disagrees with Apple's suggestion that the proposed SUPERNet devices can co-exist with spread spectrum products and services in the 5.8 GHz band.[8] As Metricom and other Part 15 providers demonstrated in their comments, the proposed SUPERNet devices will be technically incompatible with present Part 15 operations in the 5.8 GHz band. Frequency hopping, spread spectrum devices that are presently authorized to operate in the band will cause harmful interference to the wideband, low-power SUPERNet devices. Direct sequence spread spectrum devices that are presently operating in the band may be seriously degraded by SUPERNet systems.[9] This view is shared by independent analysts

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[7] Comments of Apple at pp. 7-9.

[8] Comments of Apple at p. 16.

[9] Comments of Cylink at pp. 7-9. Comments of Western Multiplex at p. 4. Comments of Larus at p. 2.

from the NSF who expect SUPERNet to be incompatible with present Part 15 uses of the 5.8 GHz band:

> We oppose the FCC's own proposal of extending the SUPERNet service . . . to the 5.725-5.875 GHz band. . .on the grounds that this would cause interference with already permitted Part 15.247 radios, which radios can already perform data transmission tasks under current rules for "community networking" purposes that Apple's proposal purports to do. Permitting the FCC NPRM proposed low power services in the same upper band could seriously degrade the ability of services transmitting point-to-point under 15.247 rules at longer ranges between buildings - such as school districts, or across cities, or between rural towns and the closest points of presence of other services such as the Internet.[10/]

IV. THE COMMISSION MUST PROTECT AND PROMOTE PART 15 OPERATIONS UNDER SECTION 15.247 IN THE 5.8 GHZ BAND.

If the Commission ultimately decides to designate the 5.8 GHz band for SUPERNet use, interference between SUPERNet and spread spectrum Part 15 devices must be governed under present Part 15 rules. Under no circumstances should the Commission impede or otherwise restrict the operation of non-SUPERNet Part 15 devices in the 5.8 GHz band. Metricom vehemently objects to those commenters who suggest that the Commission should elevate the status of SUPERNet operations above that of spread spectrum Part 15 operations in the band.[11/] Because proposed SUPERNet devices are incompatible with spread spectrum devices, elevating SUPERNet

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[10/] Comments of the National Science Foundation Wireless Field Test For Education Project at p. 2.

[11/] See footnotes 12 & 13 below.

devices would severely impede the operations of spread spectrum devices in the 5.8 GHz band.

Several commenters suggest that the Commission create a new Part 16 to govern SUPERNet and consider SUPERNet a recognized radio service.[12/] Other commenters suggest that the Commission license SUPERNet devices in the 5.8 GHz band.[13/] The Commission should reject both of these suggestions because they would elevate SUPERNet over spread spectrum Part 15 products and services in the 5.8 GHz band, and consequently, impede the ability of spread spectrum Part 15 operations -- a proven technology that provides affordable NII connectivity to schools and communities -- to operate effectively.

There is substantial record evidence in this proceeding regarding the great consumer success and public benefits of Part 15 products and services in the 5.8 GHz band.[14/] In particular, there is record evidence of the important role that Part 15 services have played in providing schools and other users with

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[12/] E.g., Comments of Apple at pp. 27-29; Comments of Nortel at pp. 13-14; Comments of the Consumer Electronics Manufacturers Association at p. 8; Comments of the Information Technology Industry Council at p. 6.

[13/] E.g., Comments of AT&T at pp. 3-5; Comments of TIA at pp. 4-8; Comments of Harris Corporation at p. 3.

[14/] Comments of the National Science Foundation Wireless Field Test For Education Project at p. 2. Comments of the Connectivity For Learning Coalition at pp. 4-6. Comments of Western Multiplex at pp. 2-3. Comments of Cylink.

cost-effective, wireless NII access.[15] In contrast, SUPERNet, at best, is an idea which may or may not produce useful communications devices and will likely force schools and other users to utilize expensive wired backbones.[16] It would not be sound public policy, and, in fact, it would contradict the stated goals of the SUPERNet NPRM, for the Commission to elevate SUPERNet over spread spectrum Part 15 products and services in the 5.8 GHz band.

Similarly, spread spectrum Part 15 operations must have the same "safe harbor" protections as proposed SUPERNet devices.[17] Several commenters support the Commission's proposal to afford SUPERNet devices a safe harbor whereby an unlicensed SUPERNet device would not be deemed to cause harmful interference to a licensed device provided that the SUPERNet device operated within certain technical parameters.[18] Metricom supports such comments so long as Part 15 devices operating under Section 15.247 are afforded the same safe harbor. There is no public policy justification for regulating unlicensed SUPERNet devices more

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[15] Comments of the National Science Foundation Wireless Field Test For Education Project at p. 2. Comments of the Connectivity For Learning Coalition at pp. 4-6. Comments of Cylink at p. Comments of Metricom at pp. 19-21.

[16] Comments of the Connectivity For Learning Coalition at pp. 3-4. Comments of the Benton Foundation at pp. 5-7.

[17] NPRM at ¶ 54.

[18] E.g., Comments of Nortel at p. 10; Comments of TIA at pp. 9-10. Comments of WINForum at p. 32

favorably than other unlicensed devices that have a track record of serving the public interest. Therefore, Section 15.247 devices must be afforded the same safe harbor protections as proposed SUPERNet devices.

V. TO MITIGATE INTERFERENCE IN THE 5.8 GHZ BAND, THE COMMISSION MUST NOT ADOPT A SHARING PROTOCOL OR COMPLEX ETIQUETTE AND, INSTEAD, MUST MANDATE THAT SUPERNET DEVICES OPERATE IN A SPREAD SPECTRUM MODE.

Metricom strongly disagrees with those commenters who suggest that the Commission adopt a sharing protocol or etiquette in addition to basic technical rules for the SUPERNet bands.[19/] The Commission's recent trend toward favoring complex etiquettes as a method to avoid interference in unlicensed bands is seriously misguided and will certainly lead to decreased innovation and product development.

As noted by 3-Com Corporation, "the most innovative solutions to ground breaking technical questions come, not from committees, but from small groups of engineers given the resources, time and

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[19/] E.g., Comments of WINForum at pp. 20-22. In fact, without any possible knowledge of final rules for the SUPERNet band, WINForum has already established a working group to develop an etiquette for the band, and convened the first meeting of this group on July 30, 1996. See, also, Comments of Apple at pp. 26-27; Comments of the Consumer Electronics Manufacture Association at p. 4. Comments of Hewlett Packard at pp. 3-5.

goal of focusing and solving technical problems."[20/] As a matter of both experience and common sense, creative engineers guided by minimal technical standards will design communications solutions to match consumer needs. The explosion of Part 15 products and services is evidence of this fact. In contrast, WINForum's idea of developing a complex etiquette will stop creativity in its tracks and severely lessen the potential public benefit of the SUPERNet band.

The Commission's experience with spread spectrum non-etiquette bands has been extremely positive. Today, literally millions of unlicensed devices are deployed across the U.S. and are operating in the 915 MHz, 2.4 GHz and 5.8 GHz bands. Part 15 manufacturers have designed unlicensed devices to be adaptive and to mitigate and avoid interference. Encouraged and enabled by the minimal technical standards contained in Section 15.247 of the Commission's rules, these devices operate successfully at power levels up to 1.0 watt (plus antenna gain) without the need for an etiquette. The success of this approach based upon real world experience stands beyond question.

[20/] Comments of 3-Com Corporation at p. 8. In addition, Motorola urges the Commission to reject an etiquette because "interference can be more directly avoided by the use of directional antennas and diversity algorithms likely to be prevalent at 5 GHz in order to provide reliable operation." Comments of Motorola at p. 7.

In contrast, and despite all the Commission's and commenters' rhetoric regarding the efficacy of etiquettes in preventing interference, there is absolutely no evidence that complex etiquettes do, in actual fact, prevent interference. Though several commenters endorse the adoption of an etiquette, not a single commenter cites an example where an etiquette has been implemented and has prevented interference. In only one instance - unlicensed PCS - has the Commission adopted an etiquette. This etiquette has become quite cumbersome, has spawned virtually no innovative technologies, and cannot be said to prevent interference because few devices are deployed in that band.

Therefore, to hasten the deployment of technologies and devices in the public interest, the Commission must facilitate the development of intelligent, adaptive devices that mitigate and avoid interference and must reject untested and technology-constricting sharing protocols and complex etiquettes.

The only effective way to implement this strategy is to mandate that SUPERNet devices operate in a spread spectrum mode rather than a channelized mode in the 5.8 GHz band. To accommodate multimedia uses, Section 15.247 could be amended to allow for wider bandwidth applications in the 5.8 GHz band.[21/]

[21/] Granted, the requirement for very wide bandwidth channels for SUPERNet devices would decrease the number of available hopping channels in the 5.8 GHz band; however, there is 150 MHz of spectrum available in the band. This amount of available spectrum would (continued...)

Requiring SUPERNet devices to operate in a spread spectrum mode would resolve important outstanding issues in this proceeding. First, the risk of interference between SUPERNet and non-SUPERNet Part 15 devices would be resolved because both types of devices in the 5.8 GHz band would be operating in spread spectrum modes which are, by definition, engineered to effectively adapt to and react to interference. Experience demonstrates that there would be no need for an etiquette because technology, rather than complex rules, would mitigate interference just as it does with present Part 15 products and services operating in the unlicensed bands.

Next, requiring SUPERNet devices to operate in a spread spectrum mode would eliminate the threat they represent to presently authorized spread spectrum Part 15 devices. The Part 15 community expressed a considerable concern that existing Part 15 products and services would be impaired if SUPERNet devices

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[21/](...continued)
offset any loss in available channels caused by the requirement for wider channel bandwidths. But cf. Notice of Proposed Rule Making, Amendment of Parts 2 and 15 of the Commission's Rules Regarding Spread Spectrum Transmitters, ET Docket No. 96-8, FCC 96-36 (rel. Feb. 5, 1996), where the Commission recently denied a Petition For Rule Making filed by Symbol Technologies, Inc. ("Symbol") requesting a reduction in the minimum number of required hopping channels in the 2.4 GHz band. The Commission denied this petition because it believed that the proposal could result in severe increases in the potential for harmful interference in the 2.4 GHz band. It must be noted that the 2.4 GHz band only makes 83.5 MHz available for spread spectrum operations, while the 5.8 GHz band will make 150 MHz of spectrum available. Accordingly, the Commission's concerns expressed in response to Symbol's petition are not applicable here.

operating in a channelized mode were introduced into the 5.8 GHz band. This threat would be obviated if all Part 15 devices in the 5.8 GHz band, including SUPERNet, were operating in a spread spectrum mode.

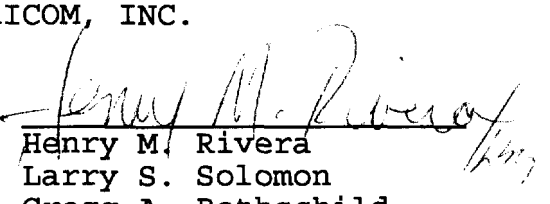
Finally, requiring SUPERNet to operate in a spread spectrum mode would promote efficient use of the band because all providers would use the entire band. Channelized devices may sit on one channel for very long periods of time and must listen until some channel is clear. In contrast, spread spectrum devices utilize the entire band, thereby maximizing the efficient use of the band because it makes the entire band available to many users.

VI. CONCLUSION

WHEREFORE, Metricom respectfully requests that the Commission take action in this proceeding consistent with the views expressed in its Comments and Reply Comments.

Respectfully submitted,

METRICOM, INC.

By: 

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